CLAIMS

What is claimed is:

1. A fluorescence imaging system comprising:

a light source for producing excitation light that induces visible fluorescence in tissue and a reference light;

an optical combiner that combines said excitation light and said reference light onto a common optical path, said combined light being coupled into an optical guide that delivers the combined light to the tissue;

an image sensor that detects a fluorescence image and a reference image of the tissue; and

a data processor that processes the fluorescence image and said reference image to produce a processed output image of the tissue.

2. The system of Claim 1 wherein the light source is an arc lamp.

3. The system of Claim 2 wherein the arc lamp current source is a pulsed source.

4. The system of Claim 1 wherein the optical guide is a removable fiberoptic extending through a biopsy channel of an endoscope.

5. The method of Claim 1 wherein the image sensor is located at a distal end of a endoscope.

6. The system of Claim 1 wherein the excitation light and the reference light are emitted sequentially such that a monochromatic image sensors detects a fluorescent image during a first time period and detects a reflected image during a second time period.

7. The system of Claim 1 wherein the excitation light and the reference light are emitted simultaneously such that respective images are detected by a color-sensitive image sensor, a blue channel detecting the fluorescence image and a red channel detecting the reference image.

8. The system of Claim 1 wherein the excitation light is in the range of 300 to 420 nm.

9. The system of Claim 1 wherein the light source further comprises a reference light source having a wavelength in a red or infrared range.

10. The system of Claim 1 wherein the optical guide comprises an optical fiber with a distally mounted lens.

11. The system of Claim 1 wherein the excitation light has an angular orientation that is the same as an angular orientation as the reference light.

12. A method for imaging tissue fluorescence comprising:

providing excitation light with a first wavelength;

providing a reference light having a second wavelength;

combining said excitation light and said reference light onto a common optical path;

detecting a fluorescence image of the tissue due to the said excitation light and a reference image of the tissue due to reflected reference light; and

processing said fluorescence image together with said reference image to produce an output image of the tissue.

13. The method of Claim 12 further comprising providing an arc lamp light source.

14. The method of Claim 13 further comprising pulsing the arc lamp current source.

15. The method of Claim 12 further comprising sequentially directing the excitation light and reference light onto the optical path and detecting the images with a monochromatic image sensor.

16. The method of Claim 12 further comprising simultaneously emitting the excitation light;

and detecting images with color-sensitive image sensor, the sensor having a blue channel detecting an autofluorescence image and a red channel detecting the reference image.

17. The method of Claim 12 further comprising coupling the excitation light and the reference light to an optical fiber such that a variation in a normalized intensity of the reference light and a normalized intensity of the excitation light is less than 20% at any point in a wavefront along the optical path between a combiner that combines the excitation light and the reference light and a tissue surface.

18. A method for imaging tissue fluorescence comprising:

providing excitation light having a wavelength in a range of 300 nm to 420 nm;

providing a reference light;

combining said excitation light and said reference light onto a common optical path such that an intensity of the excitation light varies less than 20% relative to a normalized intensity of the reference light at any point along the optical path;

detecting a fluorescence image of the tissue due to the said excitation light and a reference image of the tissue due to reflected reference light with an imaging sensor at a distal end of an endoscopic probe; and

processing said fluorescence image and said reference image to produce an output image of the tissue.

19. The method of Claim 18 further comprising determining a ratio of the fluorescence image and the reference image to provide a processed image.

20. The method of Claim 18 further comprising adjusting the relative intensity or angular distribution of the reference light relative to the excitation light.